

**WHAT IS CLAIMED IS:**

1. A blow cylinder for blow molding a container from a parison, comprising:
  - a cylinder body having a head cavity at a first body end, a rod cavity at a second body end opposite said first body end, and a rod cavity wall;
  - said rod cavity extending from said second body end to said rod cavity wall;
  - an end cap attached to said cylinder body at said first body end;
  - a piston assembly comprising a piston head, a piston rod, and a blow needle;
  - said piston head connected to said piston rod;
  - said piston rod connected to said blow needle;
  - said piston rod slidable within said rod cavity;
  - said piston head slidable within said head cavity;
  - said piston head cooperating with said head cavity to define a head space between said piston head and said end cap and a heel space between said piston head and said rod cavity wall;
  - an extend fluid port fluidly connected with said head space and fluidly connectable to a variable pressure fluid source for supplying an extend fluid;
  - a retract fluid port fluidly connected with said heel space; and,
  - a minimum pressure fluid source for supplying a retract fluid, fluidly connected to said retract fluid port.
2. A system for blow molding a container from a parison, comprising:
  - more than one blow cylinder according to claim 1; wherein,
  - said retract fluid port of each said blow cylinder fluidly connected to a common minimum pressure fluid source.
3. The blow cylinder of claim 1,
  - said minimum pressure fluid source capable of supplying retract fluid at a substantially constant pressure.
4. The blow cylinder of claim 1,

the extend fluid and the retract fluid comprising air.

5. The blow cylinder of claim 1:
  - said piston rod having a rod bore along an axis of said piston rod;
  - said blow needle having a needle bore along an axis of said blow needle; and,
  - said rod bore being fluidly connected to said needle bore.
6. The blow cylinder of claim 5, further comprising
  - a plunger having a plunger length, a first plunger end, and a second plunger end, and
  - said piston head having a head bore fluidly connected to said rod bore and fluidly connectable to said head space,
  - said plunger connected at said first plunger end to said end cap,
  - said plunger slidable within said head bore, and
  - said plunger engaging said head bore when said piston head is within a distance of said end cap less than said plunger length.
7. The blow cylinder of claim 1,
  - said end cap comprising said extend fluid port.
8. The blow cylinder of claim 1:
  - said blow needle capable of engaging the parison;
  - said variable pressure fluid source capable of being set to a greater pressure than said minimum pressure fluid source for forcing an extend fluid into said head space and a retract fluid out of said heel space for moving said blow needle to engage the parison;
  - said variable pressure fluid source capable of being set to a lesser pressure than said minimum pressure fluid source for forcing the extend fluid out of said head space and the retract fluid into said heel space for moving said blow needle to disengage the blow molded container.

9. The blow cylinder of claim 8:
  - said piston rod having a rod bore along an axis of said piston rod;
  - said blow needle having a needle bore along an axis of said blow needle;
  - said rod bore being fluidly connected to said needle bore; and,
  - said rod bore and said needle bore capable of conveying an inflate fluid into the parison with which said blow needle is engaged.
10. The blow cylinder of claim 1,
  - said variable pressure fluid source comprising a valve in communication with a pressurized supply fluid source.
11. The blow cylinder of claim 10,
  - said valve comprising a single-acting spool valve.
12. The blow cylinder of claim 10:
  - said blow needle capable of engaging the parison;
  - said valve switchable to an on position for forcing an extend fluid into said head space and a retract fluid out of said heel space for moving said blow needle to engage the parison; and,
  - said valve switchable to an off position for forcing the extend fluid out of said head space and the retract fluid into said heel space for moving said blow needle to disengage the blow molded container.
13. The blow cylinder of claim 12:
  - the movement of said blow needle to engage the parison and the movement of said blow needle to disengage the blow molded container capable of being controlled by a single cam or solenoid which switches said valve between the on position and the off position.

14. A system for blow molding a container from a parison, comprising  
more than one blow cylinder according to claim 13, wherein  
said retract fluid port of each said blow cylinder fluidly connected to a  
common minimum pressure fluid source.
15. A method for blow molding a container from a parison, comprising the steps of:  
providing a blow cylinder comprising  
a cylinder body having a head cavity at a first body end and a rod cavity wall,  
an end cap attached to said cylinder body at said first body end,  
a piston assembly comprising a piston head, a piston rod, and a blow needle,  
said piston head connected to said piston rod,  
said piston rod connected to said blow needle,  
said piston head slidable within said head cavity,  
said blow needle having an extended position, and  
said piston head cooperating with said head cavity to define a head space  
between said piston head and said end cap and a heel space between said piston  
head and said rod cavity wall;  
providing a minimum fluid pressure in said heel space; and,  
forcing an extend fluid at a pressure greater than said minimum fluid pressure  
into said head space for moving said blow needle to said extended position to  
engage a parison.
16. The method for blow molding a container of claim 15,  
said minimum fluid pressure being substantially constant.
17. The method for blow molding a container of claim 15,  
said forcing the extend fluid into said head space comprising switching on a  
valve fluidly connected with said head space and with a pressurized supply  
fluid source.

18. The method for blow molding a container of claim 15,  
the extend fluid comprising air.
19. The method for blow molding a container of claim 15, further comprising the steps of:  
inflating the parison with an inflate fluid;  
releasing the extend fluid from said head space by reducing the pressure on said extend fluid to less than said minimum fluid pressure for moving said blow needle to disengage said blow needle from the blow molded container.
20. The method for blow molding a container of claim 19,  
said step of releasing the extend fluid from said head space comprising switching off a valve fluidly connected with said head space and with a pressurized supply fluid source, said valve having a bleed feature.
21. The method for blow molding a container of claim 19,  
said piston rod having a rod bore along an axis of said piston rod,  
said blow needle having a needle bore along an axis of said blow needle,  
said rod bore being fluidly connected to said needle bore, and  
said step of inflating the parison with an inflate fluid comprising conveying the inflate fluid through said rod bore and said needle bore and into the parison.
22. The method for blow molding a container of claim 21,  
the inflate fluid comprising air.
23. The method for blow molding a container of claim 21,  
said piston head having a head bore fluidly connected to said rod bore,  
said head bore becoming fluidly connected to said head space when said blow needle is in said extended position such that the extend fluid passes through said head bore, said rod bore, and said needle bore and into the parison, the extend

fluid being the inflate fluid.

24. A blow cylinder for blow molding a container from a parison, comprising:  
extension means for moving a piston assembly to engage the parison by using an extend fluid under a variable pressure in conjunction with a retract fluid under a minimum pressure; and,  
retraction means for moving said piston assembly to disengage the container blow molded from the parison by using the extend fluid under the variable pressure in conjunction with the retract fluid under the minimum pressure.
25. The blow cylinder of claim 24,  
the retract fluid being under a substantially constant pressure.
26. The blow cylinder of claim 24,  
the extend fluid and the retract fluid comprising air.
27. The blow cylinder of claim 24:  
said piston assembly comprising a piston head, a piston rod, and a blow needle;  
said piston head connected to said piston rod;  
said piston rod connected to said blow needle;  
said piston head having a side facing away from said blow needle;  
said extension means comprising a head means for defining a head space on said side of said piston head facing away from said blow needle.
28. The blow cylinder of claim 24:  
said piston assembly comprising a piston head, a piston rod, and a blow needle;  
said piston head connected to said piston rod;  
said piston rod connected to said blow needle;

said piston head having a side facing towards said blow needle;

said retraction means comprising a heel means for defining a heel space on said side of said piston head facing towards said blow needle.

29. The blow cylinder of claim 24, further comprising  
inflation means for inflating the parison when said piston assembly engages the parison.

30. The blow cylinder of claim 29:  
said piston assembly comprising a piston head, a piston rod, and a blow needle;  
said piston rod having a rod bore along an axis of said piston rod;  
said blow needle having a needle bore along an axis of said blow needle;  
said rod bore being fluidly connected to said needle bore;  
said inflation means comprising a means for forcing an inflate fluid through said rod bore and through said needle bore and into the parison when said blow needle is engaged with the parison.